Final June 8, 2001

FISHERIES MANAGEMENT AND EVALUATION PLAN

Upper Willamette River Winter Steelhead in Sport Fisheries of the Upper Willamette Basin

Prepared by

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Executive Summary

This Fisheries Management and Evaluation Plan (FMEP) specifies the future management of recreational fisheries potentially affecting listed Upper Willamette River winter steelhead trout. Fisheries will be managed to promote the conservation and recovery of all listed winter steelhead populations in the Upper Willamette River Basin by continuing ongoing selective fisheries for hatchery fish. Only winter and summer steelhead that are adipose fin-clipped are allowed to be retained throughout the Willamette River Basin. All unmarked, wild fish will be required to be released unharmed in all fisheries. When compared to previous years (1983-1993), this selective fishing regime is expected to continue the 70% reduction in average fishery mortality that occurred prior to 1994 when wild steelhead were legal to harvest. A comprehensive monitoring and evaluation plan will assess the catch of wild fish, the abundance of hatchery and wild fish throughout the entire basin, and angler compliance. This information will be used annually to assess whether impacts to listed fish are as expected. Review of the FMEP will occur in 2006 and at five-year intervals thereafter to evaluate whether the objectives of the FMEP are being accomplished.

Fishery Management and Evaluation Plan

Upper Willamette River Winter Steelhead ESU.

Sport Fisheries of the Upper Willamette Basin.

Responsible Management Agency:

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SECTION 1. FISHERIES MANAGEMENT

1.1) General objectives of the FMEP.

The objective of this Fish Management and Evaluation Plan (FMEP) is to conduct fisheries to harvest hatchery salmon and steelhead and other fish species in a manner that does not jeopardize the survival and recovery of listed winter steelhead in the Upper Willamette River (UWR) Evolutionarily Significant Unit (ESU). **This FMEP includes all freshwater sport fisheries, which affect or could potentially affect upper Willamette River winter steelhead in the Willamette Basin and lower Columbia River.**

1.1.1) List of the "Performance Indicators" for the management objectives.

Performance indicators include fish population indicators by which we assess the status of populations in the listed ESU to determine trends in abundance, risk thresholds, and the impacts of management actions including fisheries.

The primary fish population indicators for listed Willamette winter steelhead are spawning ground redd count indices in the Molalla, Santiam, and Calapooia River basins and escapement estimates for the upper South Santiam basin based on Foster Dam counts (See Table 1, Section 1.3.2). Supplemental fish population performance indicators include spawning ground redd count indices in selected West Valley tributaries, adult counts at Willamette Falls and Stayton Island (North Santiam) fishways.

Performance indicators also include fishery indicators for monitoring fishery performance and regulating impacts within prescribed limits. The primary fishery indicators for Willamette winter steelhead sport fisheries include catch rate and fishing effort associated with statistical creel survey and spot check programs, and annual catch record card data from voluntary license returns by anglers. Statistical creel surveys targeting spring chinook and summer steelhead may be conducted in the North and South Santiam if funding can be secured. A portion of the adult winter steelhead fishery will also be sampled via these surveys.

1.1.2) Description of the relationship and consistency of harvest management with artificial propagation programs.

Harvest Management

Angling for late run wild winter steelhead has historically occurred throughout the ESU, though at relatively modest levels compared to most other Oregon steelhead waters (Clady 1971). Not surprisingly, the majority of angler effort was expended in the Santiam basin where natural production of winter steelhead is highest for the ESU. Hatchery releases for harvest augmentation of late run winter steelhead, primarily in the North Santiam, also contributed to increased angler interest in the Santiam basin.

Introductions of early-returning steelhead (Big Creek stock) into all of the major basins in the ESU (sans the Calapooia) resulted in the development of relatively small steelhead fisheries, which commenced significantly earlier than those targeting late-run fish.

The termination of all winter steelhead hatchery programs in the ESU essentially eliminated the future consumptive harvest of wild and naturally produced winter steelhead above Willamette Falls (*note: a small number of hatchery 3-salts will be returning in 2001; these fish represent the last hatchery returns to the ESU).* Although opportunities still exist for catch and release of unmarked fish, it is anticipated that angler effort targeting winter steelhead will decrease dramatically after 2001 due to the lack of consumptive harvest opportunity.

Angling regulations specific to trout and steelhead fisheries throughout the ESU have become progressively more restrictive in recent years in response to conservation concerns with native winter steelhead.

Regulations requiring the release of wild (i.e. non-finclipped) steelhead were first implemented within the ESU in 1988 on the South Santiam River above Foster dam. This action was taken in response to declining numbers of wild winter steelhead returning to this section of River *(note*: *this section of River was subsequently* ***closed*** *to steelhead angling in 1994).* In 1992, catch and release regulations were implemented on the mainstem South Santiam below Foster Reservoir. That same year, the Willamette River and tributaries above Willamette Falls were restricted to wild fish release by emergency rule due to low numbers of wild steelhead passing Willamette Falls. The remainder of the ESU converted to wild catch and release for steelhead in 1994.

The establishment of adult sanctuary areas (i.e. areas closed to steelhead angling) in the ESU first occurred in 1982 and involved Moose and Canyon Creeks (closed to all angling). Thomas, Wiley, and Crabtree Creeks (South Santiam) were permanently closed to steelhead angling in 1997 to protect small wild runs. In 1999, new adult sanctuary areas were established in the Molalla (Abiqua and Butte Creeks), Calapooia, Luckiamute, Rickreall, and Yamhill Rivers. These actions were deemed appropriate since the only adult steelhead returning to these streams were wild (sans the occasional stray); none of these streams had been stocked with hatchery steelhead for a minimum of two generations (i.e. 8 years). Starting in 2000, the Willamette River mainstem from Willamette Falls to Albany was closed to salmon/steelhead angling from November through March to protect winter steelhead adults en route to their spawning grounds. In 2001, the Tualatin River and tributaries were closed to salmon/steelhead angling as the last hatchery returns to this basin occurred the previous year.

The intent of the summer steelhead program is to create and sustain an expanded fishery for steelhead that would provide angling through the summer and fall. Summer steelhead, of which all are externally marked, start to contribute significantly to the fishery in April, attracting many anglers through the summer and early fall. The presence of adult summer steelhead in the river significantly increases pressure and may result in a larger number of wild winter steelhead being hooked and released during April and May, than might occur naturally with only wild fish present.

With the exception of Foster Reservoir on the South Santiam River, all releases of catchable trout in the upper Willamette steelhead ESU have been eliminated, in part, to eliminate incidental catch of juvenile steelhead in these fisheries.

In summary, significant and wide-reaching regulations are currently in place to protect wild winter steelhead in the Upper Willamette River basin. **Current harvest objectives are to provide anglers maximum harvest opportunity on introduced hatchery summer steelhead while not jeopardizing the survival and recovery of listed winter steelhead in the Upper Willamette River ESU. It is not anticipated that consumptive fisheries for wild winter steelhead will be reinstated in the foreseeable future.**

Hatchery Management

Historically, native late-run winter steelhead spawned in nearly all of the east side tributaries above Willamette Falls as far upstream as the Calapooia River. Dams built in the 1950s and ‘60s blocked about 60-70% of the spawning and rearing habitat in the Santiam River, the biggest producer of winter steelhead in the Upper Willamette Basin. The U.S. Army Corps of Engineers provided mitigation for that lost habitat and natural production through construction of hatcheries on the North and South Santiam rivers through the funding of chinook and steelhead production programs.

Over the past decade, an estimated 5-15% of the late-returning upper Willamette winter steelhead have been fish that were spawned, reared, and released from hatcheries. The other 85-

95% have been naturally produced fish. The only hatchery program specified to supplement the run of late-returning steelhead in the upper Willamette system was at Marion Forks Hatchery, operated by ODFW and jointly funded by the USACE and ODFW. This mitigation program in the North Santiam River, to compensate for steelhead production lost due to the construction of Detroit Dam, was begun in 1952 and terminated with the 1996 brood release in 1998. Release sizes ranged from fry to full-term smolts. The brood stock utilized North Santiam fish, typically a mix of 10-30% naturally produced steelhead with the remainder returning hatchery adults. Even though there was much variation in adult return rates, even smolt releases produced relatively low returns. Cold water and late egg take required that fish be reared for two years to achieve smolt size, resulting in a large percentage of the smolts being precocious, and not migrating to the ocean. Sampling of the production just prior to release revealed that as many as 25% of the smolts did not migrate, and did not contribute to adult returns. Adult trapping in recent years has shown the hatchery component of the North Santiam run to range from 13-30%.

Beginning in the late 1950s, early-returning steelhead from several different sources were widely stocked into the lower and middle areas of the Willamette Basin, including stream reaches supporting natural production of native steelhead. Early efforts to produce self-sustaining runs were initiated through fingerling, smolt, and adult releases, and eventually evolving into an annual smolt program using a lower Columbia River stock (Big Creek). Production was accomplished primarily through programs at Gnat Creek and Roaring River hatcheries.

As a supplement to the native winter steelhead run in the South Santiam River, a hatchery program was operated at the former South Santiam Hatchery on Coal Creek from 1926 through 1944, but has long since been discontinued. The present day South Santiam Hatchery, located at the base of Foster Dam, was constructed to provide mitigation for production areas inundated by the Foster and Green Peter pools, resulting in the loss of about 700 winter steelhead adults. Mitigation for winter steelhead was exchanged for a program to produce summer steelhead, an introduced stock (Skamaina) from the Washougal River in Washington. Since the latter 1960s South Santiam Hatchery has been producing summer steelhead smolts for release into upper Willamette streams.

Concurrent with heightened concerns for wild fish populations, hatchery practices have been revised to minimize wild fish impacts. Hatchery winter steelhead are no longer released in the Upper Willamette Basin. No stocking of winter steelhead has occurred in the Molalla since 1996 or in the North Santiam since 1998. Summer steelhead releases are currently restricted to streams where returning adults can be collected and removed from the population before they can spawn in the wild. In addition, all hatchery-reared summer steelhead and spring chinook salmon are now externally marked with an adipose fin clip that distinguishes them from naturally produced winter steelhead and spring chinook salmon. Marking allows anglers to take hatchery fish while releasing wild fish to naturally reproduce. In addition, this harvest regime allows removal of hatchery fish to preclude straying into natural production areas.

Other Willamette Basin hatchery programs release chinook and resident trout. These programs contribute to fishing opportunities for these species and all have been substantially modified to

address wild fish concerns. For instance, with the exception of Foster Reservoir on the South Santiam River, all releases of catchable trout in the upper Willamette steelhead ESU have been terminated, in part, to eliminate competition between hatchery trout and incidental catch of juvenile steelhead. Similarly, hatchery coho and fall chinook releases above Willamette Falls have been eliminated because these species were not native and could negatively affect native stocks. The NMFS biological opinion on hatchery operations found that operations of these other hatchery programs would not jeopardize the continued existence of listed fish species in the basin (NMFS 2000).

1.1.3) General description of the relationship between the FMEP objectives and Federal tribal trust obligations.

There are no Federal tribal trust obligations in this FMEP.

1.1.1) Fishery management area(s)

1.2.1) Description of the geographic boundaries of the management area of this FMEP.

This management plan includes all freshwater fisheries, which affect or could potentially affect upper Willamette River winter steelhead. Included are all freshwater fisheries managed under the sole jurisdiction of the state of Oregon occurring within the boundaries of the Willamette Basin including the mainstem Willamette River from its confluence with the Calapooia River (RM 119) to its mouth at the Columbia River and Multnomah Channel to it's mouth at the Columbia River, Molalla River, and Santiam River. Also included are impacts to upper Willamette winter steelhead that occur in lower Columbia River mainstem sport and commercial fisheries during winter and spring (January-May) between the Columbia River mouth and the Willamette River mouth. This plan includes both Willamette Basin and lower Columbia fisheries affecting or potentially affecting UWR winter steelhead because these fisheries are addressed jointly in management and catch allocation processes and the impacts in one area cannot be considered independent of the other.

Fisheries targeting winter steelhead in this area occur in waters used for migration and, in the case of the Molalla and Santiam systems, juvenile rearing. **The Department estimates that 77% of the habitat used for spawning and rearing winter steelhead is closed to salmon/steelhead angling.** Specifically, this includes all of the Tualatin, Yamhill, Rickreall, Luckiamute, and Calapooia River basins as well as tributaries of the Molalla, North Santiam and South Santiam River basins. Additionally, the mainstem and tributaries of the South Santiam River above Foster Reservoir are closed to salmon and steelhead angling.

1.2.2) Description of the time periods in which fisheries occur within the management area.

Fisheries occur within the management area throughout the period of freshwater residence by adult and juvenile UWR winter steelhead. Fisheries targeting adult winter steelhead occur primarily around the peak of freshwater migration and gradually follow the fish upriver from November through May. Fisheries targeting other species occur year-round. No fisheries target juvenile winter steelhead (Table 1).

Adult UWR winter steelhead return to Upper Willamette from November through May. The native steelhead is predominantly a late-returning stock, entering the upper river from mid-February through May (Clady 1971). Earlier-returning fish are believed to be heavily influenced by past hatchery releases of Big Creek stock. Juveniles are present in the subbasin year round but only in tributaries during the summer. Smolt emigrations occur in the spring, typically as age-2 fish.

Sport winter steelhead fisheries: Fisheries for winter steelhead occur in the Willamette Basin from November through May. Angler harvest is restricted to adipose fin-clipped hatchery steelhead only and occurs primarily in the lower Willamette River. A small number of hatchery winter steelhead is anticipated to return to the North Santiam in 2001, the last expected hatchery contribution to the upper basin winter steelhead run, and the last opportunity for anglers to harvest a hatchery winter steelhead upstream of Willamette Falls. Juvenile steelhead are present in the Willamette mainstem, Molalla, and Santiam rivers during the adult fishery. Catch and release only (zero bag limit) for trout and seasonal closures are in effect to protect juvenile steelhead.

Sport summer steelhead fisheries: Fisheries for summer steelhead occur in the lower Willamette mainstem, upper Willamette mainstem, and Santiam River. Summer steelhead are not native to the Upper Willamette Basin, but were introduced into the basin in the late 1960s to provide a sport fishery and to mitigate for lost winter steelhead production. The summer steelhead fishery begins in March and extends through December, but the greatest degree of effort and most of the catch occurs from May through August. Summer steelhead anglers may encounter winter steelhead adults, as both are present during the March through May period. The Columbia River from the mouth to the I-5 Bridge does not open to angling for hatchery steelhead until May 16, after the winter steelhead run has passed upstream. Juvenile steelhead are present in the Willamette mainstem, Molalla, and Santiam during the adult fishery. Catch and release only (zero bag limit) for trout, and seasonal closures are in effect to protect juvenile steelhead.

Sport resident trout fisheries: Fisheries for resident trout occur in tributaries and standing waters throughout the Willamette Basin. Impacts on juvenile steelhead are thought to be minimal however, due to a combination of factors including: 1) recent modifications to hatchery trout

stocking programs 2) seasonal closures, 3) catch and release only (zero bag limit) for trout and 4) gear restrictions. Stream stocking of hatchery trout into the North Santiam, South Santiam, Molalla, Yamhill, Rickreall, and Luckiamute Rivers was discontinued and shifted to standing waters after 1997. Implementation of these measures throughout the ESU (*with the exception of Foster Reservoir on the South Santiam River discussed below*) has resulted in a significant decrease in trout angling activity throughout the region.

Stocking of hatchery trout for consumptive fisheries is restricted to standing waters and streams outside the ESU to avoid impacts on juvenile steelhead. These stocking programs and fisheries occur above or in the same reservoirs whose dams block historic salmon and steelhead migrations. Catch and release regulations and bait prohibitions are in effect for trout angling throughout the ESU to protect juvenile steelhead. Trout season openers in running waters of the ESU have been postponed until late May after smolts have emigrated.

The only exception to application of the aforementioned steelhead conservation measures is Foster Reservoir on the South Santiam River. The reservoir is currently stocked with catchable rainbow trout and open year round to harvest. The use of bait is allowed in order to optimize harvest of hatchery trout. Creel surveys conducted in the early 1980's documented the presence of wild winter steelhead smolts in the catch. In 2000, ODFW initiated efforts to implement regulation changes (i.e. seasonal closure with a late opener, catch and release of unmarked trout) designed specifically to provide increased protection to juvenile winter steelhead occupying the reservoir. This proposed change was met with stiff opposition from the local community and affected angling public and was eventually withdrawn by the Department from consideration. Subsequent to these events, ODFW has developed a proposal to evaluate the impact of the trout fishery on the winter steelhead resource of the upper South Santiam River. The proposal consists of 1) a comprehensive angler creel in Foster Reservoir and 2) an assessment of the steelhead population in the upper South Santiam River. Funding for the proposal is currently being pursued through the US Army Corps of Engineers.

During the initial reviews of the FMEP, NMFS expressed concern over the existing trout regulations in Foster Reservoir and impacts to listed winter steelhead. NMFS indicated that a change in the regulations to the retention of only marked, adipose-clipped trout would be required before the FMEP could be approved. **Therefore, if NMFS follows through with the requirement that angling regulation changes occur at Foster Reservoir as a condition of FMEP approval, this FMEP proposes to change existing regulations at Foster Reservoir to allow only marked, hatchery trout be retained. This change would likely go into effect beginning in 2002**. The existing season and gear regulations would remain unchanged, unless additional information or analyses suggest otherwise.

Sport spring chinook fisheries – Willamette Basin: Fisheries for spring chinook salmon occur in the Multnomah Channel and the lower Willamette River upstream to Willamette Falls, upper Willamette River mainstem, Molalla River, and the Santiam River and forks. Chinook fisheries

are open year round or reopen under permanent regulations on January 1 in most areas and commence as fish enter the area, beginning with the Multnomah Channel and lower Willamette, in February and March. Spring chinook passage at the Willamette Falls occurs starting in April. The fisheries in the Willamette mainstem, below and above the falls, may incidentally intercept winter steelhead. Fisheries in the Molalla and Santiam can intercept adult steelhead during April and May. Juvenile steelhead are present in the Willamette mainstem, Molalla, and Santiam during the spring chinook fishery. Gear restrictions and seasonal closures are in effect to protect juveniles.

Sport spring chinook fishery – lower Columbia River: The spring chinook sport fishery from the Columbia River mouth to the I-5 Bridge is open under permanent regulations from January 1 through March 31. During most recent years, the fishery has closed March 11 to protect upriver spring chinook that typically begin to show after that date, but the fishery has also been extended into April when impacts on upriver chinook allow. This fishery may incidentally intercept some winter steelhead. Wild steelhead are prohibited from harvest year round. The states of Washington and Oregon individually set regulations concerning sport fisheries in the mainstem Columbia, however, the regulations are generally identical.

Sport spring chinook fisheries – Columbia River Select Areas: Small sport fisheries for spring chinook occur in "Select Areas" of the lower Columbia River including Youngs Bay, Blind Slough, and Tongue Point. Select areas are off-channel bays and sloughs where terminal fisheries are conducted for hatchery salmon which were reared and released from net pen, primarily to provide commercial fishing opportunities. Select areas are open to sport fishing under permanent regulations for the entire year to maximize opportunity on returns from net pen release programs. Impacts to winter steelhead are expected to be insignificant. The fishery is small, consisting of < 1,000 angler trips per year in the spring. Wild steelhead are prohibited from harvest year round.

Sport shad fisheries: Significant shad fisheries occur in the lower Willamette River from latter May through July. The fishery is concentrated in Multnomah Channel and at Oregon City downstream from Willamette Falls. The shad fishery in the Oregon City area is sampled with a statistical creel survey and angler trips average about 11,000 per year. The Multnomah Channel fishery is comparatively minor. Since the winter steelhead run has passed the falls by May 15, the shad fishery has no impact on adults. Essentially all of the out migrating smolts have also passed through this area by the time the shad fishery starts up, so there is also little impact to juvenile steelhead.

Sport warmwater fisheries: Significant fisheries occur in the Columbia River mainstem, Multnomah Channel, Willamette River mainstem, and lower sections of the larger tributaries for warmwater game species including largemouth bass, smallmouth bass, channel catfish, crappie, bluegill, and walleye. Warmwater fisheries also occur in standing waters throughout the basin. Winter steelhead impacts due to warmwater fisheries are insignificant. In the Columbia River, warmwater fisheries focus on off-channel, near-shore, and deep-water benthic areas where

juvenile salmonids are not common. In the Willamette River and its tributaries, warmwater fisheries are concentrated in backwaters and sloughs, which are not hospitable rearing areas for juvenile salmonids. Winter steelhead are not present in most standing waters where warmwater fisheries occur, an exception being Foster Reservoir. Fisheries are also most active during warm summer months after winter steelhead smolts have left the system and headed to the ocean. Since warmwater species potentially prey on and compete with juvenile winter steelhead, warmwater fisheries could actually provide some marginal benefit for listed steelhead if the catch were significant.

Commercial spring chinook fisheries – lower Columbia River: Winter commercial salmon fisheries occur from the Columbia River mouth upstream to Kelley Point near the mouth of the Willamette River. These fisheries currently target a small allocation of Willamette spring chinook and are severely constrained by limitations on impacts to listed upriver spring chinook stocks. Since 1968, the general management time frame for the winter season has been February 15 to March 10. The gear is restricted to an 8-inch minimum mesh size to avoid incidental handle of winter steelhead.

Commercial spring chinook fishery -- Select Areas: These terminal fisheries occur with 8" minimum mesh size gill nets during the spring in Youngs Bay, Tongue Point, and Blind Slough. Fisheries are for Willamette stock spring chinook which have been reared and released from a cooperative county, state, and industry-supported net-pen research program with a goal of 100% harvest of returning adults. The Youngs Bay program has operated since 1990 with a fishing area that extends from the Highway 101 Bridge upstream to the confluence of the Youngs and Klaskanine rivers. The fishery traditionally occurred during late-April through mid-June. However, beginning in 1998, a successful experimental, limited, full-fleet fishery began in mid-February through early-March targeting returning age-5 chinook. The net pen program was expanded in 1995 to include the Tongue Point basin and Blind Slough, where the first fisheries were set in 1998 during late-April to early-June. In 1999, the Tongue Point fishing area was expanded to include South Channel, and the Blind Slough fishing area was expanded to include Knappa Slough from the mouth of Blind Slough to the east end of Minaker Island. Effort in select areas is relatively small with as many as 75 commercial fishers expected to fish at least once, but only 30 expected to participate on a regular basis. Impacts on winter steelhead stocks are minimal.

Significant fisheries occurring within the Upper Willamette winter steelhead Management Area.				
Fishery	Area	Typical open dates	Peak period	Effect[1]
Sport				
Spring chinook	Lower Willamette R.	Year-round [3]	Mar – May	B
	Upper Willamette R.	Apr 1 – Oct 31 [3]	Apr – Jun	B
	Santiam R.	Jan 1 – Aug 15 [3]	Jun – Jul	B
Winter steelhead	Santiam R.	Year-round	Jan -Mar	A
	Molalla R.	Year-round	Jan -Mar	A
	Upper Willamette R.	Apr 1 – Oct 31 [3]	Jun - Aug	B
Summer steelhead	Upper Willamette R.	Apr 1 – Oct 31 [3]	Jun - Aug	B
	Santiam R.	Year-round	Apr – Aug	B
Sturgeon	Lower Willamette R.	Year-round	Mar - Jun	D
	Upper Willamette R.	Year-round	Jun – Sep	D
Resident trout	Lower Willamette R.	May 27 – Oct 31	None	C
	Upper Willamette R.	Year-round or Apr 22 – Oct 31	None	C
	West Side Tribs.	May 27 – Oct 31	May – Aug	C
	Molalla R.	May 27 – Oct 31	May – Aug	C
	Santiam R.	May 27 – Oct 31	May – Aug	C
	Calapooia R.	May 27 – Oct 31	May – Aug	C
	Standing waters	Year-round	Year-round	D[2]
Warmwater species	Willamette mainstem	Year-round	Jun - Aug	D
	Standing waters	Year-round	May – Sep	D[2]
Coho salmon	Lower Willamette R.	Sep 1 – Oct 31	Sep – Oct	D
Commercial / Other				
Lamprey	Willamette Falls	Jun 1 – Aug 31	July	D

[1] *A = winter steelhead target fishery, B = potential for incidental encounter of winter steelhead adults, C = potential for incidental encounter of winter steelhead juveniles, D = winter steelhead not encountered.*
[2] *Wild winter steelhead not present in system with the exception of Foster Reservoir in the South Santiam basin.*
[3] *Regulations sometimes modified based on year-specific expectations and goals.*

1.3) Listed salmon and steelhead affected within the Fishery Management Area specified in section 1.2.

Listed salmon and steelhead present in Willamette Basin include upper Willamette River spring chinook (threatened effective May 24, 1999), upper Willamette River steelhead (threatened effective May 24, 1999), and lower Columbia River steelhead (threatened effective May 18, 1998), and Columbia River chum salmon (threatened effective May 24, 1999) (this ESU includes lower Willamette). The presence of naturally spawning fall chinook salmon in the lower Clackamas River is unclear but if present, these fish would be included in the lower Columbia River chinook salmon ESU (threatened effective May 24, 1999). Listed salmon and steelhead present in the lower Columbia River during the winter/spring time period considered by this plan also include Snake River spring/summer chinook (threatened effective May 22, 1992) and upper Columbia spring chinook (endangered effective May 24, 1999). However, upriver chinook stocks enter the Columbia River after the bulk of the Willamette winter steelhead run.

This plan considers fishery impacts solely on listed upper Willamette River winter steelhead. This ESU includes native winter-run populations from Willamette Falls upstream to and including the Calapooia River. Significant natural populations occur in the Molalla, Santiam, and Calapooia Rivers. Additionally, smaller, but still significant natural populations occur in several West Valley tributaries (Tualatin, Yamhill, Luckiamute, Rickreall).

Fishery impacts in the lower Columbia River on all listed stocks including upper Willamette winter steelhead are addressed by other plans or consultation processes (i.e. Mainstem Columbia River *Biological Opinions*). Fishery impacts in the Willamette Basin on listed upper Willamette chinook, lower Columbia River steelhead, and lower Columbia River chinook salmon are considered in separate Fish Management and Evaluation Plans prepared by the Oregon Department of Fish and Wildlife. The FMEP for Upper Willamette spring chinook was approved in February 2001. Naturally spawning steelhead populations from the Willamette River mouth to Willamette Falls including the Clackamas River are included in the lower Columbia River steelhead ESU.

1.3.1) Description of "critical" and "viable" thresholds for each population (or management unit) consistent with the concepts in the technical document "Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units."

NMFS defines population performance in terms of abundance, productivity, spatial structure, and diversity and provides guidelines for each (McElhany et al. 2000). NMFS identifies abundance guidelines for critical and viable population thresholds. Critical thresholds are those below which populations are at relatively high risk of extinction. Critical population size guidelines are reached if a population is low enough to be subject to risks from: 1) depensatory processes, 2) genetic effects of inbreeding depression or fixation of deleterious mutations, 3) demographic stochasticity, or 3) uncertainty in status evaluations. If a population meets one critical threshold, it would be considered to be at a critically low level. Viability thresholds are those above which

populations have negligible risk of extinction due to local factors. Viable population size guidelines are reached when a population is large enough to: 1) survive normal environmental variation, 2) allow compensatory processes to provide resilience to perturbation, 3) maintain genetic diversity, 4) provide important ecological functions, and 5) not risk effects of uncertainty in status evaluations. A population must meet all viability population guidelines to be considered viable.

Productivity or population growth rate guidelines are reached when a population's productivity is such that: 1) abundance can be maintained above the viable level, 2) viability is independent of hatchery subsidy, 3) viability is maintained even during poor ocean conditions, 4) declines in abundance are not sustained, 5) life history traits are not in flux, and 6) conclusions are independent of uncertainty in parameter estimates. Spatial structure guidelines are reached when: 1) number of habitat patches is stable or increasing, 2) stray rates are stable, 3) marginally suitable habitat patches are preserved, 4) refuge source populations are preserved, and 5) uncertainty is taken into account. Diversity guidelines are reached when: 1) variation in life history, morphological, and genetic traits is maintained, 2) natural dispersal processes are maintained, 3) ecological variation is maintained, and 4) effects of uncertainty are considered.

This fishery management plan focuses primarily on abundance and productivity which are the two key performance features most directly affected by fishery impacts of the scale we propose. Spatial structure is generally a function of habitat size and distribution. Proposed fisheries do not affect habitat. The small fishery impact rates proposed also will not reduce population sizes to levels where spatial effects are exacerbated. Diversity concerns for UWR winter steelhead are primarily related to the effects of natural spawning by hatchery fish. The small, proposed fishery impact rates on wild fish are not expected to exert sufficient selection pressure on any single characteristic to affect diversity. See section 2.1.2 for a more detailed discussion of why the harvest regime is not likely to result in changes to biological characteristics of the affected ESUs.

The NMFS provides limited guidance on fish numbers corresponding to critical and viability thresholds. They discuss hypothetical risks related to genetic processes effective at annual spawning population ranging from 50 to several thousand individuals. (McElhany et al. 2000).

The public review draft (March 2001) of this FMEP specified critical and viable abundance thresholds based upon the analysis presented in Chilcote (2001). Upon further discussions with NMFS, our critical thresholds were lower than NMFS was comfortable with as "trigger points" to further reduce fishery impacts when the populations declined to critically low levels. Based on the guidance in McElhany et al. (2000), Chilcote's viable thresholds were more aligned with NMFS' intentions for critical thresholds. Therefore, the final draft of this FMEP changed the initial viable thresholds to critical thresholds.

Since no change in fisheries management will occur (i.e. continue selective fisheries for the retention of hatchery fish only) if the listed populations rebound to healthy abundance levels, viable threshold levels were purposefully not specified in the FMEP. This was deemed

appropriate for this FMEP because of the low risks posed by the fisheries to listed winter steelhead. Impacts to winter steelhead will never increase substantially under the selective fishing regime because of the low catch rates observed in the Willamette Basin. Based on data from the last 20 years, the highest catch rate was approximately 31% (Appendix 2). Assuming a 5% catch-and-release mortality rate, worst-case impacts from fishing would be a 1.6% mortality rate at the ESU level. Fishery impacts will not be increased beyond the incidental mortality levels associated with catch-and-release fishing at any population status that is above the critical level thresholds. Impacts will likely range from 0% to 1.6% at any abundance level.

1.3.2) Description of the current status of each population (or management unit) relative to its "Viable Salmonid Population thresholds" described above. Include abundance and/or escapement estimates for as many years as possible.

Five major basins historically produced upper Willamette winter steelhead including the Molalla, North Santiam, South Santiam, Calapooia, and West Valley (i.e. Luckiamute, Rickreall, Yamhill, Tualatin). Dams in the Santiam basin eliminated wild winter steelhead production in significant portions of this system.

The Upper Willamette populations analyzed by Chilcote (2001) exceed critical thresholds for abundance and productivity during recent years (Table 1).

Chilcote examined the trend in annual pre-harvest abundance of wild fish for 31 steelhead populations in Oregon. In some cases, such as the West [Willamette] Valley population, the data was inadequate for meaningful evaluation. However, for the remaining Upper Willamette populations it was possible to look at the pattern of wild fish abundance for the last 20 to 30 years (Appendix 1).

For each monitoring location, annual estimates of adult spawner abundance or density (fish per mile) were determined from direct adult enumeration at counting facilities (Foster Dam) or redd counts (all other locations). Conversion of redds per mile to spawners per mile, discrimination between hatchery and wild fish, and estimation of cumulative fishery mortality on wild steelhead was similar to methods described by Chilcote (1998). Estimates of pre-harvest abundance for wild steelhead were obtained by dividing annual estimates of spawner abundance by 1 minus the associated harvest rate. *Population specific data on which abundance estimates are based is also presented graphically in Appendix 1.*

Statewide, nearly all the 31 Oregon populations, including those from the Upper Willamette ESU, examined by Chilcote (2001) had a rapid decline in abundance during the early to mid 1990s and a low point in abundance during the late 1990s. However, beyond this shared characteristic there appeared to be 3 semi-distinct temporal patterns of steelhead abundance. As

characterized by Chilcote (2001): "*By far the most common pattern (Type 1) is characterized by a period of low abundance, followed by a period of greater abundance, and then most recently a second, but more severe low period. The Type 2 pattern is similar to the Type 1, however in the case of the Type 2 the first period of low abundance is deeper than the second low abundance period. A third pattern (Type 3) was also recognized. It was characterized by a steady decline with no peak in abundance or evidence of cyclic character. This pattern appears most commonly for steelhead populations in the Upper Willamette and Lower Columbia ESUs.*"

Table 1. List of conservation abundance thresholds and observed 6-year average wild steelhead abundance for 5 populations of steelhead belonging to the Upper Willamette ESU. Abundance expressed as either total spawners (data without decimal points) or spawners per stream mile (data with decimal points). Viable thresholds were purposefully not identified (see explanation above) because no management changes will occur as long as the populations exceed critical abundance thresholds (i.e. continue catch and release fisheries for wild steelhead).

Natural Populations (or Management Units)	Critical Thresholds	Viable Thresholds	Recent 6-year Average	Associated Hatchery Stock(s)	Hatchery Stocks Necessary For Recovery? (Y/N)
Molalla	9.9	NA	14.0	None	NA
North Santiam	16.6	NA	21.9	None	NA
Lower South Santiam	8.1	NA	8.4	None	NA
Upper South Santiam	108	NA	312	None	NA
Calapooia	2.2	NA	8.3	None	NA

1.4. Harvest Regime

The primary focus of this FMEP is on fisheries that target adult winter and summer steelhead where the majority of fishery-related impact occurs. Summer steelhead runs in the Willamette begin as early as March, and therefore co-occur with winter steelhead in the river. The modification of certain hatchery programs for winter and summer steelhead has significantly reduced, but not eliminated the potential fishery impacts on native winter steelhead adults and juveniles. The Oregon Department of Fish and Wildlife proposes to continue the adult steelhead catch-and-release fishing regime currently in place in the Upper Willamette ESU. This regime has been structured and implemented over a number of years to provide what we believe to be highly significant protection to both adult and juvenile winter steelhead. **Our long-term intent is to provide consumptive fisheries for hatchery summer steelhead while minimizing fishery-associated mortality on wild winter steelhead**. We do not anticipate the re-establishment of consumptive fisheries for winter steelhead in the foreseeable future.

An additional component of this FMEP is other sport fisheries (i.e. trout, shad, warmwater, sturgeon), which may incidentally encounter juvenile winter steelhead when smolts are out-

migrating. Sturgeon fisheries use large hooks and baits and fish and fish in locations that effectively preclude interception of smolts or rearing steelhead. Trout fisheries in streams are restricted to catch and release, prohibit the use of bait, and result in a mortality rate on fish released of less than 5%. Overall impacts to the juvenile steelhead resource are believed to be small since anglers encounter but a small fraction of the fish present in a given reach of stream and catch and release-associated mortality is low. Recent modifications to hatchery trout programs has prompted many anglers to focus their efforts on standing waters where listed steelhead are not present.

1.4.1) Provide escapement objectives and/or maximum exploitation rates for each population (or management unit) based on its status.

Available fishery information suggests that **the existing catch and release fisheries result in fishing mortalities which approximates 1.2% of the population, much below the harvest rate limits of 20% and 10% proposed in this plan (see following discussion).** Again, the long-term intent in this FMEP is to provide consumptive fisheries for hatchery summer steelhead while minimizing fishery-associated mortality on wild winter steelhead. We do not anticipate the re-establishment of consumptive fisheries for winter steelhead in the foreseeable future.

To assess potentially acceptable fishery related impacts, maximum exploitation rates were developed for each population. However, the term "fishery mortality rate" was used instead of "exploitation rate" to clarify that under current wild fish catch and release regulations only a small fraction of the fish that are caught are actually removed from the spawning population (they die). For example, if 50% of a wild steelhead population is in caught in a sport fishery and the post-release mortality rate of these caught fish is 5%, then the fishery mortality rate is 5% of 50% or 2.5%.

Maximum fishery mortality rates for each population were developed based on a PVA analysis described by Chilcote (2001). The assessment entailed performing a series of PVA model runs for a range of different assumed adult mortality rates (AMR) for 27 populations of Oregon steelhead. For each population the probability of extinction (PE) over a 50-year time period was estimated for 16 mortality rates between 0% and 75%.

This analysis lead to several findings, applicable to nearly all populations. First, for most populations when fishing-related mortality rates were less than 35%, the probability of extinction was 0.00.

Secondly, once a mortality rate was found that increased the probability of extinction above 0.00, an increment of an additional 20% in mortality rate was usually sufficient to result in a probability of extinction of 1.00. Since the transition from low risk to high risk happens so rapidly once the threshold (or critical) mortality rate is exceeded, management strategies should set a limit on maximum mortality rates at some level considerable less than this trigger point. To do otherwise leaves no room for logic errors in the model used to forecast these impacts, nor

does it allow for any error in the actual measurement of mortality rates. Since for most populations the trigger point is a mortality rate of 35% or higher Chilcote (2001) contends that amortality rate limit of 20% is a reasonable conservation standard for most steelhead populations in Oregon. Therefore, **the 20% maximum fishery mortality rate limit was used for all populations except the North Santiam.** A different limit was used for this population because it clearly emerged as the population most vulnerable to harvest-related impacts (Table 2). Its probability of extinction in 50 years substantially increased , once mortality rates became greater than 10%. For the North Santiam the 10% AMR constitutes the *threshold mortality rate* or *trigger point* (i.e. the point at which the transition to a 100% PE is rapid). Therefore, it is recommended that the **maximum fishery mortality for the North Santiam population be no greater than 10% and preferably less than 5%**. In arriving at this limit the relative "strength" of the other populations in the ESU was also given consideration.

Table 2. PVA simulations of estimated probability of extinction in 50 years for 5 populations of Oregon steelhead under 16 different hypothetical adult mortality rates.

	Percent Adult Mortality Rate															
Population	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**
Molalla	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.20	.68	.88
N. Santiam	.03	.11	.31	.63	.88	.99	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lower S. Santiam	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02	.03	.05	.29	.51	.75	.92
Upper S. Santiam	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.51	.96	1.0	1.0	**1.0**
Calapooia	.00	.00	.00	.00	.01	.08	.12	.30	.59	.88	.98	1.0	1.0	**1.0**	**1.0**	**1.0**

Available information suggests that the existing catch and release fisheries result in mortalities which approximates 1.2% of the population (see following discussion), much below the harvest rate limits of 20% and 10% proposed in this plan.

Fishing mortality rates on wild winter steelhead for ESU fisheries were estimated by examining Willamette Falls passage data and ODFW salmon/steelhead tag returns (Appendix 2). During the unrestricted (i.e. no fin-clipped only requirement) winter steelhead fishery from 1983-91, an average of 21.8% of the total run (early and late, hatchery and wild) was harvested. From 1994-97, when only marked fish could be harvested, the catch rate was 6.6% of the total run. That is a 70% reduction in harvest rate, indicating that 70% of the '83-91 harvest was on wild fish. Assuming the '94-'97 total harvest of hatchery fish (290) represents 30 % of the total catch (wild and hatchery), it would indicate that perhaps 967 fish were caught: 290 hatchery that were retained and 677 wild that were released. Application of the 5% handling mortality factor to the 677 wild fish released equates to an annual average fishing-related mortality of 34 wild fish.

Application of the 70% wild-component assumption to Willamette Falls counts produces an average wild run estimate to the ESU of 2860 fish for the 1994-97 period. An average annual fishing-related mortality of 34 fish equates to an overall **fishing mortality rate of 1.2 percent of the wild population in the Upper Willamette basin.**

Data analysis from an angler creel conducted by ODFW on the North Santiam River in 2000 suggests that the percent handling mortality imposed by the North Santiam fishery on the total wild steelhead run into the ESU (as estimated at Willamette Falls) approximates 0.1 %. Analysis of North Santiam punch card data for 1997 (*note: Willamette Falls counts for '97 and '00 were nearly the same*) suggests that **percent mortality imposed by the fishery on the total run approximated 0.3%.** The difference between these estimates may, in part, be due to the fact that the 2000 creel did not commence until May and thus missed a the early portion of the winter steelhead fishery.

1.4.2) Description of how the fisheries will be managed to conserve the weakest population or management unit.

Sport steelhead angling in the Upper Willamette ESU is currently managed to provide significant protection to the listed wild stocks. If the abundance of any of the populations in the ESU is forecasted (or determined based on in season information) to drop below the viable threshold levels established in Table 1, then additional fishery restrictions will be implemented as specified in section 3 to further reduce fishery impacts.

Mandatory wild release regulations for adult steelhead have been in effect for the ESU since 1994 and will continue under permanent state regulations into the foreseeable future. Additional protection is afforded through the establishment of adult sanctuary areas as described in section 1.1.2.

Significant protection for juvenile steelhead is also being provided under the current harvest management strategy. While natural bait is legal when angling for salmon and steelhead, the fact that approximately 77% of the ESU is closed to salmon and steelhead angling, where no bait is allowed, affords significant protection to juvenile steelhead. Additional juvenile steelhead protection is provided by having eliminated legal rainbow stocking and associated angling pressure in all steelhead waters except Foster Reservoir on the South Santiam River. With the exception of Foster, all trout angling in the ESU is restricted to a late May opener, catch and release, and artificial flies and lures.

As discussed in section 1.4.1 above, fishing mortality rates on wild steelhead stocks in the ESU will be restricted to 20% or less under this FMEP, the exception being the North Santiam which will be limited to 10%. It is estimated that under existing catch and release regulations fishing mortality rates do not exceed 5% and are likely considerably lower. Less than 2% of the annual

wild steelhead return to the ESU is anticipated to be lost to hook and release mortality as a result of sport angling (see section 1.4.1).

It is assumed that continued implementation of the conservation measures described in this FMEP will generally preclude the need to impose additional restrictions on the fisheries. However, in the event that populations decrease in abundance to levels less than the critical thresholds given in Table 1, additional, more conservative measures will be implemented to limit fishery associated mortalities on wild fish will be implemented. **If the critical threshold values are reached on any of the Willamette populations, then additional time, area and/or fishing gear restrictions would be proposed to further reduce sport hook and release mortality to the affected wild steelhead.**

In-season projections of total wild escapement to the ESU can be developed via statistical analysis of fish passage at Willamette Falls. In 1992, emergency regulations (wild catch and release) were implemented in-season on the upper Willamette and tributaries due to low numbers of steelhead passing the falls. An analysis of the relationship between Willamette Falls passage (Appendix 2) and tributary escapement levels (in the context of critical/viable thresholds) will be performed so that appropriate regulatory conservation "triggers" can be established.

1.4.3) Demonstrate that the harvest regime is consistent with the conservation and recovery of commingled natural-origin populations in areas where artificially propagated fish predominate.

There are no releases of hatchery winter steelhead smolts in the entire Upper Willamette ESU. However, adult hatchery summer steelhead are present in the Santiam River, and anglers may encounter some wild winter steelhead adults during the March through May period. This overlap in run timing (winter steelhead vs. summer steelhead) and associated angling effort for adult summer steelhead, occurs in only a fraction of the total wild winter steelhead production area of the Upper Willamette basin (see Section 1.1.2 for a description of adult sanctuary areas). In addition, steelhead angling is essentially restricted to migration corridors, with the vast majority of spawning areas closed to steelhead angling.

The selective fishery strategy currently in place in the Santiam basin is geared to minimizing impacts wild winter steelhead while maximizing the harvest of hatchery summer steelhead. All hatchery smolts are finclipped, and sport anglers can legally retain only adult hatchery steelhead with a missing adipose fin. Observations by the Oregon State Police (OSP) indicate angler compliance with wild release regulations is high (in excess of 90%, see Section 3.4). It is estimated that the mortality rate associated with existing catch and release fisheries is 5% or less of the fish handled based on data collected by Hooton (1987).

There are no hatchery steelhead deemed essential to the survival of the species in this ESU. Season and area closures, gear restrictions, wild steelhead release regulations, and a consistently

high level of wildlife law enforcement all combine to minimize the loss of wild steelhead in the subbasin.

1.5. Annual Implementation of the Fisheries

The Oregon Fish and Wildlife Commission (Commission) adopts angling regulations every year with and extensive public involvement process every four years. This process begins about one year in advance of when specific regulations are actually adopted. Current regulations require release of wild (unmarked) steelhead in the Upper Willamette, Molalla and Santiam rivers (all other streams in the ESU are closed to steelhead angling) and trout and warmwater fisheries are designed to protect juvenile steelhead. There is no sport fishery planned that would allow retention of wild fish in the ESU.

Numbers of wild steelhead returning to the Upper Willamette basin can be estimated by determining the number of wild steelhead passing through the Willamette Falls fishway. This relationship has been described in Section 1.1.1 of this plan. If estimates of wild steelhead counted at Willamette Falls indicate additional conservation measures are necessary, then emergency regulations further restricting fisheries can be implemented.

There is also a process in place to implement regulations on a much shorter time schedule than every four years that addresses emergency conditions. These emergency regulations can be adopted by the Commission within 2 weeks if a Commission meeting is scheduled near the same date. The Commission has also delegated to the Director of ODFW the authority to adopt emergency regulations. If the Director adopts emergency regulations, they can be implemented within a matter of days from the time they are submitted.

SECTION 2. EFFECTS ON ESA-LISTED SALMONIDS

2.1) Description of the biologically-based rationale demonstrating that the fisheries management strategies will not appreciably reduce the likelihood of survival and recovery of the affected ESU(s) in the wild.

Steelhead Fisheries

Current fishing regulations in the Upper Willamette ESU require that *all* unmarked adult steelhead be released back to the wild unharmed. There is no retention of unmarked, listed steelhead in the ESU. Only adult steelhead with an adipose fin clip may be retained in recreational fisheries.

The best available scientific information suggests hook and release mortality of adult steelhead is low. Hooton (1987) found catch and release mortality of adult steelhead to be 3.4% (n= 3,715 fish) on average when using a variety of fishing tackle, including barbed and barbless hooks, bait

and artificial lures. Hooton concluded that catch and release of adult steelhead was an effective mechanism for maintaining angling opportunity without negatively impacting stock recruitment.

Reingold (1975) showed adult steelhead hooked, played to exhaustion, and then released returned to their target spawning stream as well as steelhead not hooked and played to exhaustion.

The overall impact from recreational fishing should be assessed at the population level. Since it is very unlikely that every fish in a population will be caught, overall mortality rates are substantially lower than the estimated mortality rates. For example, if 50% of the steelhead population is caught and released with a 5% catch-and-release mortality rate, the overall impact from fishing to the population would be 2.5%. Information on the rate at which unmarked steelhead are encountered in mainstem Upper Willamette and tributary recreational fisheries is limited. The best information suggests that encounter rates are typically less than 10% and most likely in the range of 10-30% (NMFS 1998). These encounter rates would result in an overall impact to a steelhead population of 0.5% to 2.5% from recreational fisheries.

Fishing rates identified in this plan do not appreciably reduce the likelihood of survival and recovery of wild Willamette River winter steelhead. This statement is based on an assessment by Chilcote (2001) of the impacts of human-caused fish mortality (e.g., fisheries) on the status and recovery of steelhead Oregon. This assessment, involving Population Viability Analysis (PVA), is described in section 1.4.1 of this FMEP.

In general, these PVA results indicated that for four of the five Upper Willamette winter steelhead populations examined a maximum fishery mortality rate limit of 20% is sufficient to minimize the biological risk of the fisheries involved. The exception to the 20% standard is the North Santiam population where, as discussed in section 1.4.1, we believe a cumulative mortality rate (CMR) of 10% is acceptable. **Mortality rates associated with the fisheries currently impacting all Upper Willamette populations are currently estimated to range between 0% and 2%** (Table 3). It is believed that the upper CMR limits of 10% and 20% for the North Santiam and other five Upper Willamette populations, respectively, will not be met or exceeded under the proposed management regime.

Trout Fisheries

With the exception of Foster Reservoir on the South Santiam River, no retention of trout of any size is allowed in the streams within the geographic boundaries of the listed steelhead ESU. All trout caught must be released unharmed. As discussed in section 1.2.2, NMFS staff have indicated that a requirement for approval of this FMEP will be a change in the angling regulations at Foster Reservoir beginning in 2002 allowing only marked, hatchery trout to be legal for harvest, all unmarked trout must be released unharmed. After 1998, stocking of hatchery trout in waters where listed steelhead reside was terminated (exception: Foster Reservoir). Late-May openers are in place on steelhead streams to minimize the number of

smolts exposed to trout fisheries. These management changes are expected to reduce the mortality of juvenile steelhead while they are rearing in streams.

Until 1999, bait could be used during the general trout season (end of May through October) throughout the ESU. Since hooking mortality studies (summarized in NMFS 1998) have shown bait to result in significantly higher ($p<0.05$) mortality rates than other gear types, there was concern that using bait could be off-setting the benefits of having a catch and release wild trout fishery. Wydoski (1977) showed the average mortality of trout when using bait to be more than four times greater than the mortality associated with using artificial lures and flies. Taylor and White (1992) showed average mortality of trout to be 31.4% when using bait versus 4.9% and 3.8% for lures and flies, respectively. Schisler and Bergersen (1996) reported average mortality of trout caught on passively fished bait to be higher (32%) than mortality from actively fish bait (21%). Mortality of fish caught on artificial flies was only 3.9%. Therefore, the use of bait when angling for trout during the summer was prohibited after 1998. Anglers are now restricted to artificial flies and lures only when fishing for trout in streams throughout the ESU.

Since the use of bait in adult steelhead and salmon fisheries has *not* been shown to result in higher mortality rates compared to artificial flies and lures (as discussed in Hooton, 1987), bait is still permitted in adult salmon and steelhead fisheries. However, since an estimated 77% of the ESU is closed to adult salmon and steelhead angling (where use of bait is not allowed), significant juvenile salmon and steelhead sanctuary areas are provided.

With the exception of Foster Reservoir on the South Santiam River, streams in the ESU do not allow retention of any trout (resident rainbow, cutthroat, or steelhead). In these cases, impacts are post-release mortality associated with catch and release fishing.

In Foster Reservoir, where retention of wild trout is currently permitted, minimum size requirements for retained fish make it unlikely that many juvenile steelhead will be harvested. In general, most wild steelhead smolts are less than eight inches in length (Busby et al. 1996). However, at Foster Dam, wild steelhead smolts greater than eight inches have been observed during emigration periods. In 2001, all catchable rainbow trout released in Foster reservoir will be adipose-clipped. Since NMFS staff have indicated that a requirement for approval of this FMEP will be a change in the angling regulations at Foster Reservoir, it is therefore likely that regulations requiring the release of all trout less than 10 inches and greater than 20 inches in length will be implemented in 2002. In the interim, we are planning to initiate a public education campaign emphasizing wild steelhead conservation in the reservoir (e.g. encouraging the release of wild fish, employing proper catch and release technique, etc.). There are no plans at this time to implement in Foster the usual suite of steelhead conservation measures that are currently in place throughout the rest of the ESU (e.g. seasonal closure with late-May opener, bait prohibition, and termination of catchable rainbow program). If requested funding is forthcoming, a comprehensive angler creel (and possibly steelhead population assessment) will be conducted on Foster in 2001. The objective of this effort is to assess the effect of the very popular trout fishery on the native steelhead resource of the upper South Santiam basin. Again,

the only regulation change likely to occur prior to the acquisition of new information (produced by the aforementioned fishery assessment) is that requiring the release of trout less than 10 inches and greater than 20 inches in length.

Fishing effort for trout throughout the ESU is currently much lower than in previous years because of the elimination of hatchery trout stocking in streams and the conservative, selective fishing regulations. It is likely that only a small percentage of the juvenile steelhead rearing in a watershed would be caught and released because of the current regulations and sanctuary areas that are closed to all fishing. NMFS assessed the benefits of recent angling regulation changes for steelhead along the Oregon Coast (NMFS 1998). It was concluded that these changes likely resulted in a substantial reduction in harvest mortality of juvenile and adult steelhead. Since many of the regulations are similar in the Lower Columbia and Middle Columbia River, **Upper Willamette**, and Snake River Basin ESUs, it is expected that overall mortality would be within the range estimated along the Oregon Coast (<1% to 10%).

It is difficult to quantify the impacts to juvenile steelhead from sport fishing because of the lack of information and variation in fishing effort among the areas within the ESU. However, given the current regulations that are in place for juvenile steelhead, overall impacts are likely to be quite low. As a result, in the upper Willamette ESU we estimate that less than 1% of the juvenile steelhead population will be handled catch and release trout fisheries The aforementioned management changes to trout programs are expected to significantly reduce the mortality of juvenile steelhead.

Warmwater and Nongame Fish Fisheries

Fisheries occur in the mainstem Willamette and lower sections of some upper Willamette River (UWR) tributaries for warm water game species including largemouth bass, small mouth bass, crappie, bluegill, warmouth, catfish, etc. Nongame fisheries involve carp, northern pikeminnow, largescale sucker, peamouth, and chiselmouth. In the UWR tributaries, warm water fisheries are concentrated in backwaters and sloughs, which are generally not hospitable rearing areas for juvenile salmonids. Fisheries are also most active during warm summer months after spring migrant juvenile steelhead have left the system.

Since warm water species potentially prey on and compete with juvenile salmonids, warm water fisheries could actually provide some marginal benefit for steelhead if the warm water catch were significant. In 2001, liberalized regulations for bass went into effect on the Calapooia and Santiam basins, including Foster Reservoir, for the express purpose of reducing predation on native winter steelhead. A study investigating the extent of bass predation on juvenile salmonids in the mainstem Willamette River upstream of Willamette Falls was initiated in 2000. The results of this effort will be used to determine if additional changes are warranted in this section of river.

Sturgeon Fisheries

Small sturgeon fisheries occur in the mainstem Willamette above Willamette Falls. The fishery is open year-round and legal sturgeon retention sizes are 42 to 60 inches. Sturgeon anglers fish with large baits on the river bottom and use very large hooks. Salmon and steelhead impacts in sturgeon fisheries are believed to be insignificant. For the last several years ODFW has deployed baited setlines at strategic locations on the mainstem in order to gather biological information on sturgeon. Though the technique has produced numerous sturgeon and the occasional nongame species, we have yet to encounter a salmonid during sampling.

2.1.1) Description of which fisheries affect each population (or management unit).

Adult wild winter steelhead from four of the population units (Molalla, North Santiam, Lower South Santiam, and Upper South Santiam) in the Upper Willamette ESU are potentially affected by fisheries targeting salmon and steelhead in the mainstem Willamette and the lower mainstems of the aforementioned streams. Steelhead from two additional population units (West Valley and Calapooia) are closed year round to salmon/steelhead angling, and are therefore potentially affected only by fisheries in the mainstem Willamette.

2.1.2) Assessment of how the harvest regime will not likely result in changes to the biological characteristics of the affected ESUs.

Fishing impact rates are small and spread over the breadth of the run so that no subcomponent of the wild stock will be selectively harvested at a rate substantially larger than any other portion of the run. No significant harvest differential will occur for different size, age, or timed portion of the run. In addition, low fishing rates for wild fish will result in increased numbers of wild spawners even in periods of poor freshwater migration and ocean survival conditions. Larger populations will be less subject to genetic risks and loss of diversity associated with small population sizes. Finally, increased harvest rates of hatchery fish in selective fisheries should benefit wild stock integrity and diversity by removing a greater fraction of the hatchery fish that could potentially stray into wild production areas.

2.1.3) Comparison of harvest impacts in previous years and the harvest impacts anticipated to occur under the harvest regime in this FMEP.

Current impact rates in freshwater fisheries are substantially reduced from historic levels (Table 3). Historic fishing mortality rates on wild winter steelhead for ESU fisheries were estimated by examining Willamette Falls passage data and ODFW salmon/steelhead tag returns (Appendix 2). During the unrestricted (i.e. no fin-clipped only requirement) winter steelhead fishery from 1983-91, an average of 21.8% of the total run (early and late, hatchery and wild) was harvested. From 1994-97, when only marked fish could be harvested, the catch rate was 6.6% of the total run. That is a 70% reduction in harvest rate, indicating that 70% of the '83-91 harvest was on wild

fish. Assuming the '94-'97 total harvest of hatchery fish (290) represents 30 % of the total catch (wild and hatchery), it would indicate that perhaps 967 fish were caught: 290 hatchery that were retained and 677 wild that were released. Application of the 5% handling mortality factor to the 677 wild fish released equates to an annual average fishing-related mortality of 34 wild fish.

Application of the 70% wild-component assumption to Willamette Falls counts produces an average wild run estimate to the ESU of 2860 fish for the 1994-97 period. An average annual fishing-related mortality of 34 fish equates to an overall **fishing mortality rate of 1.2 percent of the wild population in the Upper Willamette basin.**

Data analysis from an angler creel conducted by ODFW on the North Santiam River in 2000 suggests that the percent handling mortality imposed by the North Santiam fishery on the total wild steelhead run into the ESU (as estimated at Willamette Falls) approximates 0.1 %. Analysis of North Santiam punch card data for 1997 (*note: Willamette Falls counts for '97 and '00 were nearly the same*) suggests that **percent mortality imposed by the fishery on the total run approximated 0.3%.** The difference between these estimates may, in part, be due to the fact that the 2000 creel did not commence until May and thus missed a the early portion of the winter steelhead fishery.

Past harvest impacts to juvenile steelhead as a result of trout fisheries in the Upper Willamette basin are unknown. Cramer et al (1997) were of the opinion that the greatest sport harvest of steelhead in recent times may have been on juveniles taken in trout fisheries, rather than on adults. This was likely the case in Upper Willamette tributaries considering the regulations and management practices in place for many years.

For example, stocking of catchable trout and the resultant intensive trout fisheries occurred in the lower North Santiam, upper South Santiam, Molalla, Yamhill, Rickreall, and Luckiamute rivers for many decades until discontinued after 1997. These important winter steelhead spawning and rearing streams likely received significant impacts to natural steelhead production during that time as a result of fishery and ecological effects from trout stocking and resultant fisheries. After 1998, all trout fishing in the Upper Willamette ESU has been mandatory catch and release of trout and no bait is allowed.

The more restrictive angling regulations presently in place, combined with no trout stocking in streams likely provides significantly greater protection to juvenile steelhead from angling mortality than occurred historically. In addition, fishing effort for trout throughout the ESU is currently much lower than in previous years because of the elimination of hatchery trout stocking in streams and the conservative, selective fishing regulations

Table 3. Estimated Wild Steelhead Fishery Mortality Rates (Chilcote 2001)

Spawning Year	Population				
	Molalla	North Santiam	Upper South Santiam	Lower South Santiam	Calapooia
1980	0.21		0.21		0.10
1981	0.21		0.21		0.10
1982	0.21		0.21		0.10
1983	0.21	0.21	0.21	0.21	0.10
1984	0.21	0.21	0.21	0.21	0.10
1985	0.21	0.21	0.21	0.21	0.10
1986	0.21	0.21	0.21	0.21	0.10
1987	0.21	0.21	0.21	0.21	0.10
1988	0.21	0.18	0.21	0.21	0.10
1989	0.21	0.18	0.21	0.21	0.10
1990	0.21	0.18	0.21	0.21	0.10
1991	0.21	0.18	0.21	0.21	0.10
1992	0.02	0.03	0.02	0.02	0.02
1993	0.02	0.03	0.02	0.02	0.02
1994	0.02	0.02	0.02	0.02	0.02
1995	0.02	0.02	0.02	0.02	0.02
1996	0.02	0.02	0.02	0.02	0.02
1997	0.02	0.02	0.02	0.02	0.00
1998	0.02	0.02	0.02	0.02	0.00
1999	0.02	0.02	0.02	0.02	0.00
2000	0.02	0.02	0.02	0.02	0.00

2.1.4) Description of additional fishery impacts not addressed within this FMEP for the listed ESUs specified in section 1.3. Account for harvest impacts in previous year and the impacts expected in the future.

Ocean catch of steelhead by sport fishermen off the Oregon coast is rare (Schindler, 2000). It is not legal to include steelhead in offshore commercial catches in Alaska, Oregon, California, or Washington. British Columbia does allow an incidental catch of steelhead, but the number caught is small (Caverhill, 2000). Columbia River impacts are described in section 1.2.2 and are estimated to be less than 2% (ODFW and WDFW 2000).

SECTION 3. MONITORING AND EVALUATION

3.1) Description of the specific monitoring of the "Performance Indicators" listed in section 1.1.1.

Performance indicators for Willamette winter steelhead include fish population indicators and fishery indicators. Independent estimates or indices of numbers are available annually for each wild population.

Primary fish population indicators for wild Willamette winter steelhead are spawning area redd counts in the Molalla, Santiam, and Calapooia Rivers and selected west-side tributaries and spawning escapement estimates from upstream migrant traps at Stayton Island on the North Santiam (partial estimate only as trapping confined to latter portion of the run due to current operational constraints), Minto dam on the North Santiam, and Foster dam on the South Santiam. Secondary fish population indicators include: 1) observations of juvenile winter steelhead and resident *O. mykiss* made during summertime snorkel surveys in standard index reaches in the Santiam and Calapooia basins, 2) fish population sampling using electrofishing and/or seining methodologies as part of ongoing relative abundance/distribution surveys and/or population indices (entire geographical area).

Steelhead counts at Willamette Falls provide valuable information on combined hatchery and wild escapement into the upper basin. The fish ladder and counting facility at Willamette Falls is operated by the ODFW. Salmon and steelhead are counted 24 hours per day, 365 days per year (Foster 1998). Counts are made with a video recording system and are read regularly during the steelhead and spring chinook migration. Portland General Electric's downstream migrant sampler at Willamette Falls has produced a considerable amount of data since 1992 (e.g. relative numbers, migration timing, etc.) specific to the migration of juvenile wild winter steelhead.

Fishery performance indicators provide information on catch rate and effort. Stratified, random, roving creel surveys are conducted in the lower Willamette River from March until July. This survey includes fisheries for spring chinook, steelhead, and other species.

Spring fisheries in the Willamette River mainstem from the falls to the McKenzie River are monitored with periodic spot checks and interviews of anglers. Spot checks involve index counts of anglers in key fishing areas and boat trailers at launch sites. Spot checks also involve interviews of anglers at launch sites and voluntary reports.

Total annual catch estimates are available from returns of angler catch record cards that are issued with the fishing license. Anglers are required to immediately record every salmon retained, catch record cards are returned at the end of the year, and total catches in each area are tabulated. Catch record cards are typically returned at about a 25% rate and this sub sample is expanded for the total number of licenses issued with corrections for differential return rates by anglers which did and did not catch fish. Catch record cards provide a useful index of total

annual catches and generally appear to overestimate total catch relative to statistical angler survey estimates.

Historic data on steelhead and spring Chinook salmon fisheries in the Santiam River is available from catch record cards, spot checks and some statistical creel surveys. Statistical creel surveys are planned for implementation in the North Santiam, and potentially South Santiam, Rivers as fisheries are reopened to adipose fin-clipped spring chinook when the majority of the hatchery return can be distinguished with adipose finclips.

3.2) Description of other monitoring and evaluation not included in the Performance Indicators (section 3.1) which provides additional information useful for fisheries management.

Since the early nineties considerable effort has been dedicated to collecting information on fish use of low elevation "Valley floor" tributaries. District staff have worked closely with citizen volunteers, including many private landowners, to acquire this information on streams throughout the subject geographical area. The sampling method of choice has typically involved siting a 3-4' diameter hoop trap in the channel thalweg to intercept upstream migrants. These efforts have expanded our knowledge of these habitats as it relates to their seasonal occupation by juvenile winter steelhead and other species.

A number of potential monitoring and evaluation activities have been identified for implementation in the short term should funding support become available. These include:

- Conducting a comprehensive angler creel on Foster Reservoir to assess trout fishery impacts on wild winter steelhead.
- Operating screw traps on the South Santiam River above and below Foster Reservoir to enumerate, if possible, juvenile wild winter steelhead entering and exiting the reservoir. Development of these estimates constitutes an important element of a comprehensive assessment of the reservoir's trout fishery. This action will also provide an increased knowledge *O. mykiss* population status in the South Santiam basin.
- Operating adult traps in selected fishways on the Calapooia River. The primary goal of this effort is to evaluate the effects of flow manipulation on fish passage. Limited run size information for wild winter steelhead will also be collected.

3.3) Public Outreach

The popularity of the Willamette spring chinook and summer steelhead sport fisheries and the high visibility afforded by their proximity to metropolitan areas in the Willamette Valley result in intense public interest and participation in the management processes for these species. The ODFW conducts extensive public involvement and outreach activities related to spring Chinook salmon fishery management and recovery. The annual fishery regulation process involving a series of public meetings, information mail outs, press releases and public hearings was described in detail in section 1.5. Anglers are keenly aware of and accustomed to abrupt in-

season management changes including closures and reopenings with short notice. Permanent regulations are detailed in published pamphlets of fishing regulations. Annual regulation and in-season changes are widely publicized with press releases, phone calls or faxes of action notices to key constituents, and signs posted at fishery access points. The ODFW also operates an information line, a tape-recorded hotline, and an Internet web page where timely information is available.

In addition to fishery-related outreach efforts, the state of Oregon including the ODFW is conducting a broad-based watershed recovery effort called the Willamette Restoration Initiative (WRI). The WRI is a new effort seeking to promote, integrate, and coordinate efforts to protect and restore the health of the watershed. Designed as a public/private partnership, the Initiative works closely with state and federal agencies, while bringing a new focus to exploring the restoration interests and capabilities of businesses, landowners, non-profit organizations, local governments, and watershed councils in the basin. One of the first tasks of the Initiative has been to help guide the development of the "Willamette chapter" of the Oregon Plan for Salmon and Watersheds.

3.4) Enforcement

The Fish and Wildlife Division of the Oregon State Police (OSP) working in close partnership with the Oregon Department of Fish and Wildlife enforce sport-fishing regulations in Oregon. The OSP and ODFW work together to develop enforceable regulations to achieve fish and wildlife resource management goals. The Fish and Wildlife Enforcement Division of the OSP currently includes 128 Supervisors and Troopers including 105 assigned to general fish, wildlife, and natural resources law enforcement, and 13 Troopers assigned specifically to protection of anadromous fish and their habitat under the "Oregon Plan for Salmon and Watersheds." Another 6 Troopers are assigned to commercial fish enforcement. Permanent staff are also supplemented with cadets. Enforcement activities in the Willamette Basin are conducted from offices in Portland, McMinnville, Salem, Albany, and Springfield.

ODFW and OSP work together to facilitate enforcement of resource management goals through an annual cooperative enforcement planning process where local Troopers meet yearly with local biologists to set enforcement priorities by species. Troopers then develop tactical plans to address priority issues and gain desired compliance levels to protect resources and meet management goals. The results of each tactical plan are quantified and compared to the compliance level considered necessary to meet management goals. Compliance is typically estimated based on the percentage of angler contacts where no violations are noted. Tactical plans are adjusted if necessary based on compliance assessments to make the best use of limited resources in manpower and equipment to achieve the goals.

For the 2000 season, two action plans were implemented and evaluated to address concerns over protection of the Upper Willamette winter steelhead. **The enforcement plan for the Willamette mainstem has been in effect for 6 years, with compliance ranging from 88-97%.**

The North Santiam plan has been in place for 4 years, with compliance ranging from 81-91%. Both plans will be implemented again for the 2001 season.

3.5) Schedule and process for reviewing and modifying fisheries management.

3.5.1) Description of the process and schedule that will be used annually to evaluate the fisheries, and revise management assumptions and targets if necessary.

To insure that fish population and fishery management is meeting the goals described in this plan, annual monitoring will include wild fish escapement numbers and/or indices. Angler creels, if funded for the North (and possibly South) Santiam spring chinook and summer steelhead fisheries, will provide information on harvest of hatchery fish and handle of wild fish, fishery effort, fishery catch per unit effort, and projected fishery impacts on wild fish. Ongoing creel programs in the lower Willamette River mainstem and, to a lessor degree the upper Willamette mainstem, will also provide this information.

Numbers of wild steelhead returning to the Upper Willamette basin can be estimated by determining the number of wild steelhead passing through the Willamette Falls fishway. This relationship has been described in Section 1.1.1 of this plan. If estimates of wild steelhead counted at Willamette Falls indicate additional conservation measures are necessary, then emergency regulations further restricting fisheries can be implemented.

Compliance with provisions in this plan will be evaluated each year by the South Willamette Watershed District staff and appropriate ODFW Portland staff. When steelhead angler creel surveys are implemented, harvest rates, angler effort, and regulation compliance will be monitored. If harvest rates exceed predicted levels, then appropriate reductions in bag limits or catch and release regulations will be implemented as deemed necessary.

If average annual impact rates exceed the described in section 1.4.1, additional fishery restrictions will be implemented to reduce impacts to prescribed levels.

3.5.2) Description of the process and schedule that will occur every five years to evaluate whether the FMEP is accomplishing the stated objectives. The conditions under which revisions to the FMEP will be made and how the revisions will likely be accomplished should be included.

This FMEP is intended to remain in effect indefinitely. Wild population status and fishery performance will continue to be assessed by the Oregon Department of Fish and Wildlife on and annual basis. Brood year survival for wild winter steelhead in the Upper Willamette ESU can be assessed every five years, given average lengths of freshwater and ocean residency. This FMEP will be evaluated every five years for effectiveness. Comprehensive reviews will be repeated at that interval until such time as the ESU is declared recovered and is delisted. Revisions to this

plan will be made as performance indicators suggest that the stated objectives are not being met. Revisions will we undertaken in cooperation with appropriate Portland Headquarters and Region staff, NMFS staff, the interested public and our tribal co-managers. The Technical Review Team will be consulted during the periodic review process. Revision of this FMEP will include changes and updates in the Population Viability Analysis and viable and critical thresholds.

SECTION 4. CONSISTENCY OF FMEP WITH PLANS AND CONDITIONS SET WITHIN ANY FEDERAL COURT PROCEEDINGS

Actions and objectives contained in this proposed FMEP related to upper Willamette winter steelhead do not directly impact Federal tribal trust resources. Tribal trust resources do not exist for Willamette winter steelhead in the Willamette Basin. There are no existing court orders with continuing jurisdiction over tribal harvest allocations that are relevant to the implementation of the proposed FMEP.

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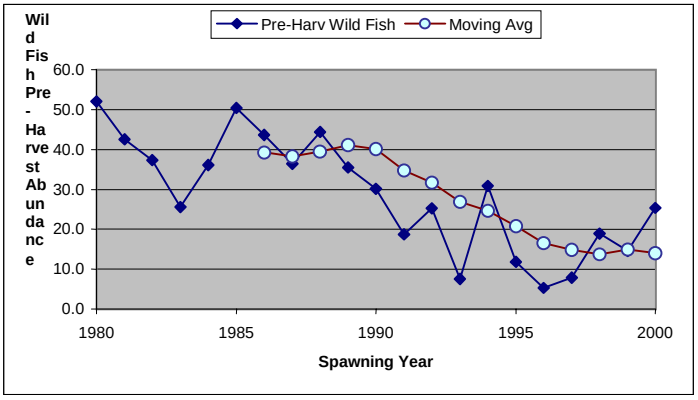
Appendix 1. "Populations at a glance" information for 5 populations of steelhead in Upper Willamette ESU.

Basin:	**Molalla**
Population:	**Molalla**
Sub-population:	
Monitoring sites:	**Index sites**
Method:	**Redd Surveys**

Critical Threshold	2.6
Viable Threshold	9.93
Last 6-yr Average	**13.98**

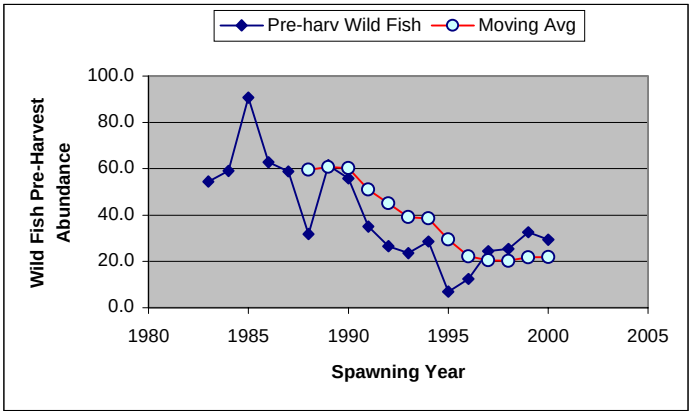


Average Distribution of Ages at time of spawning

Repeat	Age 2	Age 3	Age 4	Age 5	Age 6
0.10	0.00	0.00	0.83	0.07	0.00

Spawning Year	SpwnrsWild	SpwnrsHatc	Effective Tot. Spwnrs	Wild Fish Harv Rate	Pre- Harv Pre-Harv Wild Fish	Wild Abund 6-yr Moving Avg
1980	41.1	35.0	76.1	0.21	52.0	
1981	33.6	28.6	62.2	0.21	42.5	
1982	29.5	25.1	54.6	0.21	37.3	
1983	20.2	17.2	37.4	0.21	25.6	
1984	28.5	24.3	52.8	0.21	36.1	
1985	39.8	33.9	73.7	0.21	50.3	
1986	34.5	29.4	63.9	0.21	43.7	39.3
1987	28.8	24.5	53.3	0.21	36.4	38.2
1988	35.0	29.9	64.9	0.21	44.4	39.4
1989	28.0	23.9	51.9	0.21	35.5	41.1
1990	23.8	20.3	44.1	0.21	30.1	40.1
1991	17.8	15.1	32.9	0.05	18.7	34.8
1992	24.0	7.2	31.1	0.05	25.2	31.7
1993	7.2	2.3	9.4	0.05	7.5	26.9
1994	29.3	9.3	38.6	0.05	30.9	24.7
1995	11.2	3.6	14.8	0.05	11.8	20.7
1996	5.1	1.6	6.6	0.05	5.3	16.6
1997	7.5	2.4	9.9	0.05	7.9	14.8
1998	17.9	5.4	23.3	0.05	18.9	13.7
1999	13.9	4.1	18.0	0.05	14.6	14.9
2000	24.1	0.5	24.6	0.05	25.4	14.0

Basin:	**Santiam**
Population:	**North Santiam**
Sub-population:	
Monitoring sites:	**Index Sites**
Method:	**Redd counts**



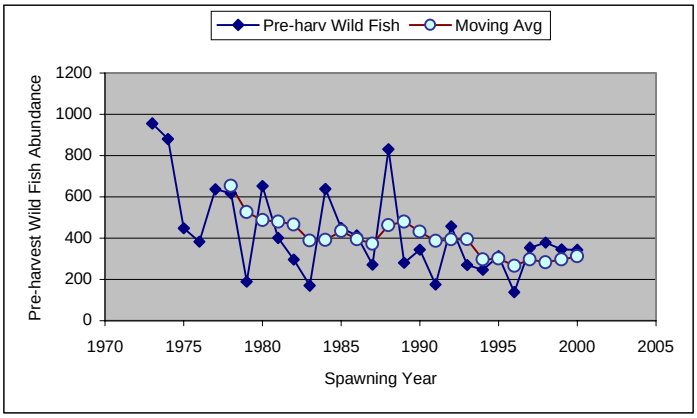
Critical Threshold	13.0
Viable Threshold	16.6
Last 6-yr Average	**21.9**

Average Distribution of Ages at time of spawning

Repeat	Age 2	Age 3	Age 4	Age 5	Age 6
0.10	0.00	0.00	0.83	0.07	0.00

Spawning Year	SpwnrsWild	SpwnrsHatc	Effective Tot. Spwnrs	Wild Fish Harv Rate	Pre- Harv e-harv Wild Fi	6-yr Moving Avg
1983	43.1	7.5	50.5	0.21	54.5	
1984	46.7	8.1	54.8	0.21	59.1	
1985	71.7	12.4	84.1	0.21	90.7	
1986	49.6	8.6	58.2	0.21	62.8	
1987	46.5	8.1	54.6	0.21	58.9	
1988	25.1	4.4	29.5	0.21	31.8	59.6
1989	48.6	8.4	57.1	0.21	61.5	60.8
1990	44.1	7.7	51.8	0.21	55.9	60.3
1991	33.3	5.8	39.1	0.05	35.1	51.0
1992	25.3	4.4	29.7	0.05	26.6	45.0
1993	22.4	4.4	26.7	0.05	23.6	39.1
1994	27.2	4.1	31.3	0.05	28.6	38.5
1995	6.7	0.8	7.5	0.05	7.0	29.5
1996	11.8	1.5	13.3	0.05	12.4	22.2
1997	23.2	2.3	25.4	0.05	24.4	20.4
1998	24.2	10.1	34.2	0.05	25.4	20.2
1999	31.0	11.2	42.2	0.05	32.6	21.7
2000	27.9	3.9	31.8	0.05	29.3	21.9

Basin:	**Santiam**
Population:	**Upper S. Santiam**
Sub-population:	
Monitoring sites:	**Foster Dam Trap**
Method:	**Total count of returning fish.**



Critical Threshold	33
Viable Threshold	108
Last 6-yr Average	**312**

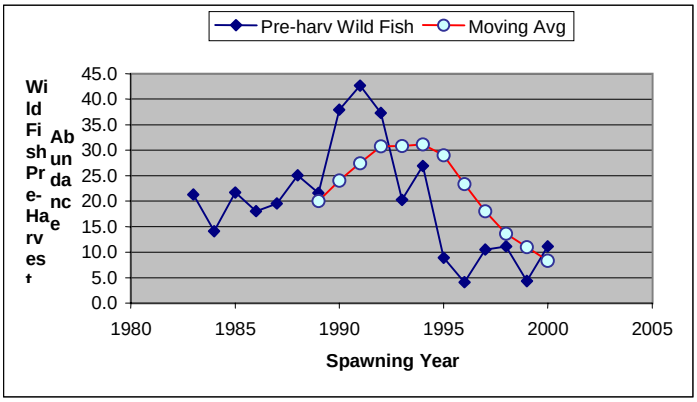
Average Distribution of Ages at time of spawning

Repeat	Age 2	Age 3	Age 4	Age 5	Age 6
0.10	0.00	0.00	0.83	0.07	0.00

Spawning Year	SpwnrsWild	SpwnrsHatc	Effective Tot. Spwnrs	Wild Fish Harv Rate	Pre- Harv e-harv Wild Fi	6-yr Moving Avg
1973	755	0	755	0.21	956	
1974	695	0	695	0.21	880	
1975	354	0	354	0.21	448	
1976	302	0	302	0.21	382	
1977	503	0	503	0.21	637	
1978	488	0	488	0.21	618	653
1979	149	0	149	0.21	189	526
1980	515	0	515	0.21	652	488
1981	317	0	317	0.21	401	480
1982	234	165	399	0.21	296	465
1983	134	66	200	0.21	170	388
1984	504	993	1497	0.21	638	391
1985	355	629	984	0.21	449	434
1986	326	485	811	0.21	413	395
1987	214	253	467	0.21	271	373
1988	656	423	1079	0.21	830	462
1989	222	62	284	0.21	281	480
1990	272	10	282	0.21	344	431
1991	139	0	139	0.21	176	386
1992	361	0	361	0.21	457	393
1993	256	0	256	0.05	269	393
1994	234	0	234	0.05	246	296
1995	297	0	297	0.05	313	301
1996	131	0	131	0.05	138	267
1997	336	0	336	0.05	354	296
1998	359	0	359	0.05	378	283
1999	328	0	328	0.05	345	296
2000	326	0	326	0.05	343	312

Basin: **Santiam**
Population: **Lower S. Santiam**
Sub-population:
Monitoring sites: **Index sites**
Method: **Redd Counts**

Critical Threshold	2.10
Viable Threshold	8.11
Last 6-yr Average	**8.35**

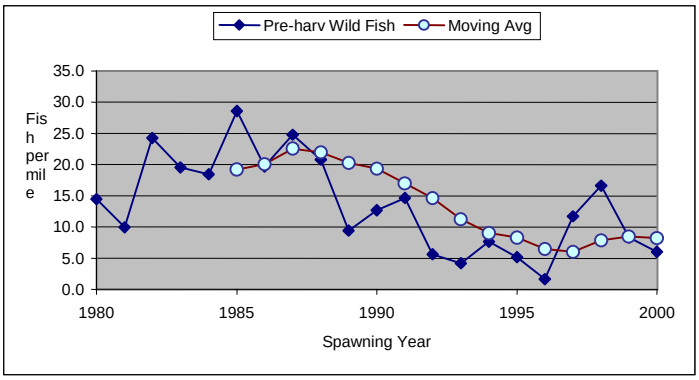


Average Distribution of Ages at time of spawning

Repeat	Age 2	Age 3	Age 4	Age 5	Age 6
0.10	0.00	0.00	0.83	0.07	0.00

Spawning Year	SpwnrsWild	SpwnrsHatc	Effective Tot. Spwnrs	Wild Fish Harv Rate	Pre- Harv Pre-harv Wild Fish	6-yr Moving Avg
1983	16.8	8.3	25	0.21	21.3	
1984	11.1	21.9	33	0.21	14.1	
1985	17.2	30.4	48	0.21	21.7	
1986	14.2	21.2	35	0.21	18.0	
1987	15.5	18.3	34	0.21	19.6	
1988	19.8	12.8	33	0.21	25.1	
1989	17.1	4.8	22	0.21	21.6	20.0
1990	30.0	1.1	31	0.21	38.0	24.0
1991	33.7	0.0	34	0.21	42.7	27.5
1992	29.5	0.0	30	0.21	37.3	30.7
1993	16.0	0.0	16	0.21	20.2	30.8
1994	25.6	0.0	26	0.05	26.9	31.1
1995	8.5	0.0	8	0.05	8.9	29.0
1996	3.9	0.0	4	0.05	4.1	23.4
1997	9.9	0.0	10	0.05	10.5	18.0
1998	10.6	0.0	11	0.05	11.2	13.6
1999	4.1	0.0	4	0.05	4.3	11.0
2000	10.6	0.0	11	0.05	11.2	8.4

Basin: **Calapooia**
Population: **Calapooia**
Sub-population:
Monitoring sites: **Index sites**
Method: **Redd Surveys**



Critical Threshold	0.80
Viable Threshold	2.23
Last 6-yr Average	**8.25**

Average Distribution of Ages at time of spawning

Repeat	Age 2	Age 3	Age 4	Age 5	Age 6
0.10	0.00	0.00	0.83	0.07	0.00

Spawning Year	SpwnrsWild	SpwnrsHatc	Effective Tot. Spwnrs	Wild Fish Harv Rate	Pre- Harv Pre-harv Wild Fish	6-yr Moving Avg
1980	13.0	0.0	13.0	0.10	14.5	
1981	9.0	0.0	9.0	0.10	10.0	
1982	21.8	0.0	21.8	0.10	24.3	
1983	17.6	0.0	17.6	0.10	19.6	
1984	16.6	0.0	16.6	0.10	18.5	
1985	25.8	0.0	25.8	0.10	28.6	19.2
1986	17.7	0.0	17.7	0.10	19.7	20.1
1987	22.3	0.0	22.3	0.10	24.8	22.6
1988	18.7	0.0	18.7	0.10	20.8	22.0
1989	8.5	0.0	8.5	0.10	9.4	20.3
1990	11.4	0.0	11.4	0.10	12.7	19.3
1991	14.3	0.0	14.3	0.02	14.6	17.0
1992	5.5	0.0	5.5	0.02	5.7	14.7
1993	4.1	0.0	4.1	0.02	4.2	11.2
1994	7.5	0.0	7.5	0.02	7.7	9.0
1995	5.1	0.0	5.1	0.02	5.2	8.3
1996	1.6	0.0	1.6	0.02	1.7	6.5
1997	11.7	0.0	11.7	0.00	11.7	6.0
1998	16.6	0.0	16.6	0.00	16.6	7.8
1999	8.3	0.0	8.3	0.00	8.3	8.5
2000	6.0	0.0	6.0	0.00	6.0	8.3

Appendix 2.

Upper Willamette StW Catch Rates
Total Run 1983-1997

Year	Will. Falls Total Count	Harvest[a] Willamette	N. Santiam	S. Santiam	Calapooia	Molalla	Others[b]	Total Harvest	Catch Rate (%)
1983	9,298	119	329	111	7	623	319	1508	16.2
1984	17,384	165	716	368	20	1216	410	2895	16.7
1985	20,592	248	1339	742	20	1119	583	4051	19.7
1986	21,251	279	1806	1181	31	1210	446	4953	23.3
1987	16,765	361	1078	603	36	1421	425	3924	23.4
1988	23,378	561	1329	555	58	1369	536	4408	18.9
1989	9,572	157	625	147	8	1020	236	2193	22.9
1990	11,107	316	919	474	6	700	241	2656	23.9
1991	4,943	212	574	168	6	465	133	1558	31.5
1992	5,396	225	194	61	7	183	146	816	15.1
1993	3,568	164	220	2	0	136	91	613	17.2
1994	5,300	119	259	19	0	23	29	449	8.5
1995	4,693	91	69	8	0	202	33	403	8.6
1996 [c]	1,801	30	14	0	0	22	14	80	4.4
1997	4,544	61	86	4	0	48	27	226	5.0
Avg. '83-91	**14,921**	**269**	**968**	**483**	**21**	**1,016**	**370**	**3,127**	**21.8**
No restrictions on catch									
Avg. '94-97	**4,085**	**75**	**107**	**8**	**0**	**74**	**26**	**290**	**6.6**
Only marked fish legal to retain									
Avg. '83-97	**10,639**	**207**	**637**	**296**	**13**	**650**	**245**	**2,049**	**17.0**

[a]Salmon/steelhead tag returns

[b]Other streams include Mary's, Luckiamute, Rickreall, Yamhill, Tualatin, and Mill Creek (Marion Co.)

[c]Will. Falls fishways inoperable for part of season, poor angling conditions all spring.